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Peaceful uses of nuclear technology

Working paper by the European Union

1. For the European Union, the Treaty on the Non-Proliferation of Nuclear Weapons remains the cornerstone of the global nuclear non-proliferation regime, the essential foundation for the pursuit of nuclear disarmament in accordance with article VI of the Treaty and an important element in the further development of nuclear energy applications for peaceful purposes. The European Union recognizes the right of States parties to the Treaty to use nuclear energy for peaceful purposes, in accordance with article IV and with due regard to articles I, II and III, and remains committed to ensuring the responsible development of peaceful uses of nuclear energy in the best safety, security and non-proliferation conditions.

2. Against this background, the European Union and its member States have used part of their assistance for the past 20 years to ensure the safe and secure use of nuclear energy. Together, they are currently one of the largest providers of aid and assistance worldwide. Several hundred million euros have been spent through various nuclear safety programmes under the European Union Instrument for Nuclear Safety Cooperation and security programmes, as well as through the Instrument contributing to Stability and Peace.

3. The Treaty provides a solid framework promoting confidence and cooperation in the peaceful uses of nuclear energy. Its thorough implementation is essential to facilitating the use of nuclear applications in a growing range of areas. The European Union believes that the use of nuclear energy must be accompanied by adherence to rigorous safety and security conditions and regulations, including at all stages of the nuclear fuel cycle. In order to ensure the peaceful uses of nuclear technology worldwide, it is paramount that the safety and security guidelines of the International Atomic Energy Agency (IAEA) be applied to technical cooperation projects that involve the use of nuclear or radiological material.

4. The European Union underscores the importance of the safe, secure and safeguarded use of nuclear energy and nuclear applications in peaceful activities around the world. It does so by working directly with countries in Europe and beyond, and by supporting the work of IAEA in that respect. Funds are channelled

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through dedicated financial instruments into the fields of nuclear safety, security and research. Funding amounts to some 150 million euros a year. The European Union and its member States also provide valuable technical and scientific support for IAEA. In the field of nuclear safeguards, the financial support of the European Union to IAEA is the second largest, and is provided through the European Commission Nuclear Safeguards Support Programme and the support programmes of some of its member States. The European Union and its member States make available their nuclear expertise to IAEA and thus contribute to the implementation of the major programmes of the Agency on nuclear safety, waste management, radiation protection, safeguards and security.

Technical cooperation and peaceful uses

5. The European Union and its member States continue to be strong supporters of the Technical Cooperation Programme of IAEA, including through the Technical Cooperation Fund and the Peaceful Uses Initiative, and are the second largest contributors to the Technical Cooperation Programme. The European Union also supports both IAEA and IAEA member States in the peaceful uses of nuclear energy and technology through technical expertise and a total amount of some 150 million euros per year. We fully appreciate the role of IAEA in promoting a responsible development of the peaceful applications of nuclear technology in the areas of, inter alia, human health, food and agriculture, water resources, environment, preservation of cultural heritage, nuclear and radiation safety and nuclear energy. The European Union is engaged with IAEA regarding three project proposals, in Burkina Faso, Ethiopia and Viet Nam, on strengthening the evidence base for nutrition programming to improve human health and a special programme on cancer control.

6. The European Union and its member States appreciate the role that IAEA has been able to play in recent years in tackling zoonotic disease outbreaks. The IAEA sterile insect technique was one of the tools used in response to the outbreak in Latin America and the Caribbean of the Zika virus disease in 2016. Likewise, the Agency's rapid diagnostic equipment, used in West Africa to help to tackle the Ebola virus outbreak, is another example of where IAEA has been able to use its expertise to respond to a crisis. It is important that IAEA continue to develop its capacity in such areas. In this respect, the European Union and its member States support the activities of IAEA at its Nuclear Sciences and Applications Laboratories in Seibersdorf, Austria, and the Director General's initiative on the much needed modernization of the ReNuAL and ReNuAL+ laboratories. The European Union and its member States have contributed more than 4.5 million euros to the laboratory renovations, in addition to providing in-kind support.

7. The European Union and its member States fully support the IAEA comprehensive Programme of Action for Cancer Therapy. This programme of work can bring cancer diagnosis and treatment to those countries where they are most needed and we encourage IAEA to continue to develop its partnerships to achieve this goal.

8. We also note positively that IAEA has been actively participating in the global development dialogue on the post-2015 development agenda, advocating the importance of nuclear science, technology, innovation and capacity-building in the

new Sustainable Development Goals framework. We believe that IAEA has an important role to play, including through its technical cooperation programme, in advancing sustainable socioeconomic development. The Sustainable Development Goals that the Agency can contribute to achieve, include, among others relevant to its competency, ending hunger, achieving food security and improved nutrition and promoting sustainable agriculture, ensuring healthy lives and promoting well-being for all at all ages, and taking urgent action to combat climate change and its impacts.

European Union nuclear research and training

9. Under the Research and Training Programme of the European Atomic Energy Community (2014-2018) complementing the Horizon 2020 Framework Programme for Research and Innovation, the Joint Research Centre of the European Commission is mandated to directly carry out research in nuclear safety, security and safeguards. The main objectives of the direct actions include: improving nuclear safety, including nuclear reactor and fuel safety, and waste management, including final geological disposal as well as partitioning and transmutation; decommissioning; and emergency preparedness; improving nuclear security, including combating illicit trafficking, and nuclear forensics; increasing excellence in the nuclear science base for standardization; fostering knowledge management, education and training; and supporting the policy of the European Union on nuclear safety. Under the Programme, the European Commission cooperates with third countries, such as Canada, China, Japan and the United States of America, on nuclear research activities.

10. On 2 December 2016, the launch event of the European Learning Initiatives for Nuclear Decommissioning and Environmental Remediation took place in Bratislava. On that occasion, the Joint Research Centre of the European Commission signed a memorandum of understanding with 13 partners active in the field of nuclear decommissioning.

European Union commitment to nuclear safety

11. The European Union has accumulated substantial experience in nuclear safety, including decommissioning nuclear installations and radioactive waste management. European Union member States possess broad expertise in all nuclear safety domains. The diversity of technology, which requires different approaches, also allows for the flexibility necessary in building cooperation with partner countries. The European Union has a coherent and comprehensive legal framework for the safe, secure and sustainable use of civil nuclear power, covering nuclear safety and radioactive waste as well as spent fuel management. The framework is also applied to areas not related to electricity generation.

12. All European Union member States and the European Atomic Energy Community (Euratom) are contracting parties to the relevant safety conventions and participate in reviews and meetings in collaboration with national and international technical support organizations, such as the Western European Nuclear Regulators Association, the European Nuclear Safety Regulators Group and the European Network of Transmission System Operators. The European Union calls upon all

IAEA member States, especially newcomer countries, to become party to the relevant conventions and actively participate.

Euratom nuclear safety regime

13. Nuclear energy is the subject of a separate treaty, the Treaty establishing the European Atomic Energy Community, to which all European Union member States are parties. We are pleased to recall that 2017 marks the sixtieth anniversary of the signing in Rome, on 25 March 1957, of the Euratom Treaty. The Euratom Treaty is treated as *lex specialis* with respect to the European Union Treaty and its Treaty on the Functioning of the European Union for all matters that are specified in it. In terms of governance, nuclear energy is covered both by the special provisions of the Euratom Treaty, which, inter alia, confers unique powers in the field of safeguards and specific external representation tasks to the European Commission. The nuclear safety of all nuclear facilities, and in particular of nuclear power plants, is an absolute priority for the European Union and its member States. The key principle is to strive for continuous improvements of safety levels in order to maintain the highest standards of safety.

14. Following the 2011 Fukushima nuclear accident in Japan, risk and safety assessments ("stress tests") of all European Union nuclear power plants were carried out to reassess their overall safety and sturdiness in the face of extreme natural events. The results confirmed that European Union member States were complying with the high standards of nuclear safety, but also recommended the implementation of tangible safety improvements. To that effect, national nuclear safety regulators have developed national action plans for the implementation of the identified recommendations. The high priority of nuclear safety for the peaceful use of nuclear energy is fully reflected in the relevant Euratom legal regime through the revision of the nuclear safety directive and the basic safety standards, and in the provisions under chapter 3 of the Euratom Treaty.

European Union nuclear safety cooperation

15. The European Union attaches the utmost importance to the worldwide implementation and continuous improvement of nuclear safety. The Euratom nuclear safety directive sets the objective of preventing accidents and, should they occur, of mitigating the consequences and avoiding early and large radioactive releases. This objective is also part of the Vienna Declaration on Nuclear Safety adopted by the contracting parties to the Convention on Nuclear Safety. The European Union and its member States emphasize the importance of the implementation of the report on building on the IAEA action plan on Nuclear Safety.

16. In support of the peaceful uses of nuclear energy, the European Union has allocated 225 million euros for the period 2014-2020 to promote nuclear safety, safety of radioactive waste and spent nuclear fuel management, radiation protection and the application of efficient and effective safeguards in third countries. Funds are channelled through dedicated financial instruments dealing with nuclear safety and safeguards for nuclear material. The European Union works directly with its partners in Europe and beyond and supports the work of IAEA.

17. The Instrument for Nuclear Safety Cooperation (2014-2020) continues to promote the highest nuclear safety levels in priority partner countries. Activities focus on:

- Promotion of an effective culture for nuclear safety and implementation of the highest nuclear safety and radiation protection standards
- Safety of radioactive waste and spent nuclear fuel management, including environmental remediation of former nuclear mining sites
- Safeguards
- International cooperation

Priority partners include countries considering the launching of nuclear programmes or needing to address radioactive waste issues. The Instrument also contributes substantially to international funds that address nuclear safety and radiation protection issues, for instance the Chernobyl Shelter Fund.

European Union support for nuclear security

18. While recognizing that nuclear security remains the responsibility of States, the European Union believes that strengthening nuclear security through international cooperation is essential for ensuring the protection of people and the environment and that nuclear security remains a crucial element in supporting and complementing technical cooperation projects on the peaceful uses of nuclear energy. National nuclear security measures and international cooperation must be in place to secure nuclear and other radioactive material and nuclear facilities and prevent illicit nuclear and radiological trafficking and terrorism. Nuclear security is an absolute necessity and is based on the efforts and responsibilities of individual States to establish appropriate systems and take the measures necessary to prevent, detect and respond to unauthorized access to nuclear and other radioactive material and nuclear facilities, protect those facilities from sabotage, and protect the transport of nuclear and radioactive material and sensitive nuclear knowledge and information against unauthorized access.

19. The European Union strongly supports the central role of IAEA in the global nuclear security architecture as widely recognized by international initiatives that have contributed to strengthening nuclear security. The IAEA Nuclear Security Advisory Services are valuable tools to assist member States in evaluating and strengthening their national nuclear security regimes. In this regard, the European Union welcomes the increased recognition and use of the International Physical Protection Advisory Service and encourages all IAEA member States to make further use of these important services, and to participate therein.

20. The entry into force of the Amendment to the Convention on the Physical Protection of Nuclear Material and Nuclear Facilities, to which all European Union member States, as well as the Euratom Community, are parties, is a milestone. The European Union supported IAEA in promoting the original Convention and its Amendment. The European Union supports the full implementation of the provisions of the Amended Convention and encourages IAEA to promote universal adherence to it.

Addressing nuclear security internally

21. With regard to nuclear and radiological security, significant progress has been made in the last decade in the European Union through the implementation of an internal plan on chemical, biological, radiological and nuclear security. In 2009, the European Union adopted a chemical, biological, radiological and nuclear security action plan to strengthen such security throughout the European Union. Based on an all-hazards approach, the overall goal of the action plan was to reduce the threat and consequences of chemical, biological, radiological and nuclear security incidents of accidental, natural and intentional origin, including terrorist acts. This all-hazards approach also has a global component through the European Union Chemical, Biological, Radiological and Nuclear Risk Mitigation Centres of Excellence Initiative, the European Union contributes to capacity-building in other countries with eight regional secretariats covering more than 56 States and with some 25 more looking to join.

22. The European Union has also developed, through the European Commission's Joint Research Centre, specific expertise in the field of nuclear detection and forensic analysis of nuclear and radiological materials. This expertise is now complemented by a comprehensive training programme for frontline responders and national experts on detection, forensics and response at the European Union's own nuclear facility. The European Commission and the European Union member States continued their nuclear forensics activities on the basic characterization of intercepted nuclear material, using advanced nuclear forensic investigation at the Joint Research Centre Institute for Transuranium Elements. Overall, nuclear materials detected and seized in more than 50 incidents have been examined, thus providing support to competent authorities in European Union member States and beyond.

European Union support for the nuclear security activities of the International Atomic Energy Agency

23. Together with its member States, through their bilateral contributions, the European Union is the second largest donor to the IAEA Nuclear Security Fund. The total European Union financial contribution to the Fund, based on six successive Council joint actions and decisions has reached almost 42 million euros for the period 2009-2016. Building on the success and lessons learned from Council Decision VI (2013/517/CFSP), in December 2016 the European Union adopted Council Decision VII (2016/2383/CFSP) thereby supporting IAEA nuclear security activities with more than 9 million euros. European Union funding to IAEA has helped the Agency to assist countries with upgrading and ensuring the physical protection of selected facilities, improve their national regulatory infrastructure concerning physical protection and the safety and security of radioactive material, and enact the necessary legislation. Numerous vulnerable sources have been protected, dismantled or disposed of, sensitive nuclear equipment and technology and border monitoring equipment have been upgraded and the training of officials has served to strengthen nuclear security worldwide. The funds have been used to support IAEA assistance projects to improve the security of nuclear and radioactive materials in the Balkans, the Caucasus region, Central Asia, the Mediterranean region, Africa and South-East Asia. This support includes legislative and regulatory

assistance for the implementation of the obligations of countries under the relevant international legal instruments, strengthening the physical protection of nuclear and radiological materials and strengthening the capabilities for detecting and responding to illicit trafficking.

24. The Euratom Research and Training Programme (2014-2018) complements the Horizon 2020 Framework Programme for Research and Innovation in the field of nuclear research and training. Euratom fission research is essentially aimed at enhancing the safety and performance records of nuclear energy production technology, contributing to the development of safe and publicly acceptable solutions for the management of radioactive waste and furthering the understanding of the effects of low doses of ionizing radiation on humans and the environment in order, notably, to ascertain strategies relevant to radiation protection.

25. The European Commission Joint Research Centre has continued to support the IAEA Illicit Incident and Trafficking Database. The Agency has acknowledged the improvements in reporting achieved through modernizing the incident notification forms website. The European Union's support in this respect will continue.

26. Building on the commitment by the Council of the European Union of 8 December 2008, the Council adopted Decision (CFSP) 2016/2001 of 15 November 2016 on a Union contribution for the establishment and the secure management of a Low Enriched Uranium Bank under the control of IAEA in the framework of the European Union strategy against the proliferation of Weapons of Mass Destruction. The contribution of more than 4 million euros will help to ensure that nuclear fuel is supplied in a secure and safe manner. It will also help IAEA to guarantee the security and safety of transporting low-enriched uranium from procurement to supply, and during storage at the Bank's site. Under the Instrument for Stability, the European Commission has already provided 20 million euros for the purpose of acquiring the low-enriched uranium once the project is fully operational.

Nuclear power production

27. The European Union underscores that each country is free to decide whether or not to include nuclear power as part of its own energy mix. If countries opt for nuclear power, it is essential that it be used safely and securely. At the twenty-first session of the Conference of the Parties to the United Nations Framework Convention on Climate Change, some IAEA member States, when communicating their intended nationally determined contributions which the Paris Agreement encourages to review every five years, stated that nuclear power played a significant role in their national energy production.

28. Nuclear energy accounts for 28 per cent (876 TWh) of the domestic production of energy in the European Union. There are 128 nuclear power reactors with a total net capacity of 119,000 MWe in operation in 14 European Union member States, managed by 18 nuclear utilities. The contribution of nuclear energy to the gross electricity production and to the energy mix differs significantly between member States. There are currently four reactors under construction, located in Finland, France and Slovakia.

29. Concerning the facilities in operation, the average age of the European reactors is approaching 30 years and questions about long term operation and replacement of the existing capacity are gradually becoming more important for member States and national safety authorities. Europe is furthermore moving to a phase where the back end of the fuel cycle will receive greater attention.

30. Concerning the facilities to be built, they should only be planned and constructed with strict adherence to relevant international conventions and nuclear safety standards, as well as national safety regulations, ensuring open dialogue with neighbouring countries and transparent public communication.

Non-power applications of nuclear and radiation technology

31. The collaboration between the Joint Research Centre of the European Commission and IAEA has been reinforced by a practical arrangement on cooperation in nuclear science and applications for sustainable development, signed by the two parties in the margins of the European Union-IAEA Senior Officials Meeting in Brussels, on 15 February 2017. The practical arrangement covers the following horizontal areas: development and production of reference materials, proficiency tests and inter-laboratory comparison exercises, development and implementation of new methodologies for obtaining and utilizing large amounts of data arising from several sources, development and validation of analytical methods, supporting best practices for high quality of measurements, development and implementation of joint educational and training courses, including workshops, and cooperation in the area of primary standardization with direct traceability.

32. Non-energy applications of nuclear technology may also contribute to climate change mitigation, for instance through improvements to soil conservation, crop enhancement and food treatments. Nuclear technologies also contribute to monitoring the effect of global efforts to reduce greenhouse gas effect emissions, through the measurement of ocean acidification. In a globalized world, nuclear technology have also a key role to play to help with food traceability, health care and anti-counterfeiting of drugs. Moreover, the support of IAEA for the development of nuclear technologies in the fight against cancer through screening instruments and adequate treatments remains one of its most important programmes.

33. Nuclear and radiation technology has many beneficial applications in Europe in vital areas such as medicine, industry and research. Furthermore, the Directorate-General for Energy of the European Commission has embarked on a series of activities with the objective of developing, by 2018, a strategic agenda for medical, industrial and research applications of nuclear and radiation technology.

Developing nuclear fusion

34. Fusion can play an important role in Europe's future energy landscape, if it can be proven as a virtually inexhaustible, climate-friendly and available energy source. Fusion reaction does not produce greenhouse gases or long-lasting radioactivity and the fuel is widely available. By the end of this century, fossil fuels will have been phased out of the energy mix and fusion, if successfully pursued, could represent a potential suitable complement to energy from renewable sources. This is particularly important following the Paris Agreement of 2015 and the commitment

by the European Union to leading the way in decarbonizing the economy and tackling global climate change in a cost-effective manner.

35. The International Thermonuclear Experimental Reactor (ITER) is the European flagship project to demonstrate the scientific and technological feasibility of fusion as a safe, environmentally responsible and abundant energy source. To this end, China, Euratom, India, Japan, the Republic of Korea, the Russian Federation and the United States (the ITER project members) agreed in 2006 to build the reactor together in Cadarache, France. Together, the participating nations represent over 50 per cent of the world's population and 80 per cent of the global gross domestic product.